

QRVA Phase 1 - IPR Comments and Proposed Resolution Approach

Comment Number	Date Received by ABS Consulting	Source	Comment	Proposed Resolution
1	12/26/2017	IPR Comments-Takara.docx	Recommend replacing 3 rd & 4 th sentences with, "This preliminary draft of the Phase 1 QRVA baseline report focuses only on the data analysis section and was submitted to support the in-progress review (IPR) meeting scheduled to be held December 5-7, 2017." [Comment 1; Page 1-1, 2 nd ¶, §1]	Agree; will revise text.
2	12/26/2017	IPR Comments-Takara.docx	Recommend changing 2 nd sentence to read, "The RHBFSF QRVA team applies probability..." [Comment 2; Page 2-5, 2 nd ¶, §2.3]	Agree; will revise text.
3	12/26/2017	IPR Comments-Takara.docx	Recommend changing last sentence to read, "Such information..." [Comment 3; Page 5/18, 4 th ¶, §5.2.1.3.1]	Agree; will revise text.
4	12/26/2017	IPR Comments-Takara.docx	Recommend changing last sentence to read, "In addition, each time the component failed the test, ..." [Comment 4; Page 5-66, 5 th ¶, §5.2.2.1.3.2]	Agree; will revise text.
5	12/26/2017	IPR Comments-Takara.docx	Recommend revising the 1 st sentence as it seems like some words may be missing. [Comment 5; Page 5-98, 1 st ¶, §5.3.3]	Agree; will revise text.
6	12/26/2017	Rev Cmmts Template for Sect 8 QRVA SOW_WP_Regin.docx	The NUREG/CR-2300 is stated to be published April 1983. The only copy I could find on-line is dated January 1983. Is the April 1983 on the internet? [Item 1; Page 2-2]	January 1983 is correct. We will revise the reference information.
7	12/26/2017	Rev Cmmts Template for Sect 8 QRVA SOW_WP_Regin.docx	2 nd line: Change "apples" to "applies" [Item 2; Page 2-5]	Agree; will revise text.
8	12/26/2017	Rev Cmmts Template for Sect 8 QRVA SOW_WP_Regin.docx	Also slide 22: Will the QRVA also consider the Security System (if there is a Security System failure, will the first responders be able to access the facility?" [Item 3; Page 3-1]	We are unclear on what the reviewer's "slide numbers" refer to in these comments. The review was to be for the IPR draft QRVA report document distributed for review, and not on any slides presented at the IPR meeting. In addition, this comment does not appear to relate to Item 3 on page 3-1 of the draft report distributed for review. Loss of the Security System is not included as an initiating event, as we are unaware of any

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				scenario that could lead to loss of fuel inventory control directly resulting from loss of the Security System. Loss of the Security System could potentially be associated with various loss of power scenarios, but would only be considered as an influencer to potential human response actions. This would more likely be an issue in an external events analysis for Phase 2-4 work (e.g., flooding, fire, and seismic event scenarios), which are not in the current scope of the Phase 1 internal events analysis.
9	12/26/2017	Rev Cmmts Template for Sect 8 QRVA SOW_WP_Regin.doc	Also slide 22: Will the QRVA also consider the telecommunication (telephones throughout the tunnel and system and from the control room to the outside world?) [Item 4; Page 3-1]	We are unclear on what the reviewer's "slide numbers" refer to in these comments. The review was to be for the IPR draft QRVA report document distributed for review, and not on any slides presented at the IPR meeting. In addition, this comment does not appear to relate to Item 4 on page 3-1 of the draft report distributed for review. Loss of the Telecommunication System is not included as an initiating event, as we are unaware of any scenario that could lead to loss of fuel inventory control directly resulting from loss of the Telecommunication System. Loss of the Telecommunication System could potentially be associated with various loss of power scenarios, but would only be considered as an influencer to potential human response actions. This would more likely be an issue in an external events analysis for Phase 2-4 work (e.g., flooding, fire, and seismic event scenarios), which are not in the current scope of the Phase 1 internal events analysis.
10	12/26/2017	Rev Cmmts Template for Sect 8 QRVA SOW_WP_Regin.doc	Also slide 22: Will the QRVA also consider the risks associated with the failure of the internet connection? Is it a stand-alone system or is it connected to NMCI that can perform updates to the system without notice?	We are unclear on what the reviewer's "slide numbers" refer to in these comments. The review was to be for the IPR draft QRVA report document distributed for review, and not on any slides presented at the IPR

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			[Item 5; Page 3-1]	meeting. In addition, this comment does not appear to relate to Item 5 on page 3-1 of the draft report distributed for review. Loss of the Internet System is not included as an initiating event, as we are unaware of any scenario that could lead to loss of fuel inventory control directly resulting from loss of the Internet System. Loss of the Internet System could potentially be associated with various loss of power scenarios, but would only be considered as an influencer to potential human response actions. This would more likely be an issue in an external events analysis for Phase 2-4 work (e.g., flooding, fire, and seismic event scenarios), which are not in the current scope of the Phase 1 internal events analysis.
11	12/26/2017	Rev Cmmts Template for Sect 8 QRVA SOW_WP_Regin.doc	Refer to the TIRM Procedure Decision Document, Attachment C for the Planned TIRM schedule for the 18 tanks.[Item 6; Page 4-1]	
12	12/26/2017	Rev Cmmts Template for Sect 8 QRVA SOW_WP_Regin.doc	2 nd to last line: Change "Stich" to "Such" [Item 7; Page 5-18]	Agree; will revise text.
13	12/26/2017	Rev Cmmts Template for Sect 8 QRVA SOW_WP_Regin.doc	Are there any references to coating failure, which will affect the risk of a release thru a defective weld? The coating system that we are proposing to use is a thick-based system that will cover over weld indications, and will prevent a release if the weld "opens up". Coating failure will increase the risk of a release if the tank is coated. The tanks are currently coated on the lower dome. The TIRM and TUA 1A both consider recoating the lower dome. [Item 8; Slide 98]	We are not aware of any such references; however, we are happy to incorporate information from them if/when identified to the QRVA project team. We do not follow the reviewers comment that "Coating failure will increase the risk of a release if the tank is coated." This is counterintuitive to our team, as a coating failure plus an opening (hole or crack) in the tank would have to exist to result in loss of fuel inventory control. We are aware of the TUA recoating alternative. However, it is important to emphasize that our Phase 1 QRVA is a baseline QRVA and will not be including any evaluations on unfunded alternatives.

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14	12/26/2017	Rev Cmmts Template for Sect 8 QRVA SOW_WP_Regin.doc	My general question is that there have been prior releases, but then does the failure rate change if the root cause of the failure has been removed, such as the removal of the tell-tails, coating the tank, replacing the sample lines on the outside of the tank, etc. [Item 9; Slide 122]	We intend to investigate alternative failure rates based on removal of certain failure modes/mechanisms. We are considering alternative initiating event frequencies based on removal of the telltales. We do not understand the reviewer's reference to "Slides" here.
15	12/26/2017	Rev Cmmts Template for Sect 8 QRVA SOW_WP_Regin.doc	Not sure about my notes, but I wrote: "UST vs AST --- corrosion occurs on soil side not matter what type of tank it is." Note that a 50,000 bbl AST has less sq ft exposed to soil than a 50,000 bbl UST. Therefore, the unit used should be sq ft exposed to soil, not size of tank. [Item 10; Slide 117]	We do not understand the reviewer's reference to "Slides" here. We do acknowledge the sq ft relationship to corrosion.
16	12/26/2017	Red Hill Sec 8 QRVA IPR comments EPA DOH 2017 12 22.pdf	1. The Regulatory Agencies are interested in the data and other supporting information that the Navy will use to evaluate its ability to detect and respond to initiating events not only for the entire facility, but also for the tanks specifically. The magnitude of any uncontrolled release is highly correlated with the ability to detect and respond to the initiating event(s). Releases that go undetected over long periods of time, or releases that are detected but do not receive an effective response can result in large-scale events that may pose a significant risk to groundwater and drinking water. The Regulatory Agencies believe there is opportunity to reduce risk at the facility by improving release detection and response practices.	Agree. However, we see no recommended change to the IPR draft QRVA report based on this comment. Our planned modeling will account for this issue.
17	12/26/2017	Red Hill Sec 8 QRVA IPR comments EPA DOH 2017 12 22.pdf	2. The Regulatory Agencies recommend that the Navy evaluate the likelihood of initiating events from the tank vessels using various sources of generic data as well as Red Hill specific data, and consider including a discussion on the range of likelihood using these different data sources. As new corrosion and pitting data from scanning the tanks during inspections becomes available, the	Agree. However, we see no recommended change to the IPR draft QRVA report based on this comment. We are investigating use of generic data sources other than NUREG/CR-6828.

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			Navy should determine whether and how this site-specific scanning data could be incorporated to revise the likelihood of an initiating event from the tanks. Considering these recommendations, the Navy and its consultant should ultimately provide their assessment of the likelihood of an initiating event, based on their professional judgement.	
18	12/26/2017	Red Hill Sec 8 QRVA IPR comments EPA DOH 2017 12 22.pdf	3. The Regulatory Agencies recommend that the Navy continue to collect data on the human factors related to release detection and response. During our meetings, it did not appear that ABSG Consulting had sufficient relevant information related to the initiation of and response to the January 2014 release. Improvements in these human factors after the January 2014 release should only be credited due to demonstrable actions, such as written operating procedures, training, etc.	Agree. However, we see no recommended change to the IPR draft QRVA report based on this comment. This has an impact on the human reliability analysis that will be performed in the Phase 1 QRVA, but this was not part of the IPR draft report. We have received additional information on the January 2014 event since the IPR meeting.
19	12/26/2017	Red Hill Sec 8 QRVA IPR comments EPA DOH 2017 12 22.pdf	4. The Navy should consider quantification of thresholds of detection during static and transient (fuel movement) operations to define range and probable release sizes. This can be achieved by applying the standard tools of the QRVA already under way.	Agree. However, we see no recommended change to the IPR draft QRVA report based on this comment. This issue is being considered within the Event Sequence Analysis of the Phase 1 QRVA.
20	12/26/2017	Red Hill Sec 8 QRVA IPR comments EPA DOH 2017 12 22.pdf	5. The Regulatory Agencies suggest segregating the release assessment into two physical areas that contain fuel. The first area would focus on the tank vessels. This would include the tank vessel and nozzle to the point of the first valve. The second area would focus on the mechanical infrastructure attached to the tank vessels, such as the piping, valves and pumps. Estimating the frequency of an initiating event from the second area may have less uncertainty due to the more standard nature of the infrastructure. Understanding nature and magnitude of risk posed by these distinct physical areas is	Agree. However, we see no recommended change to the IPR draft QRVA report based on this comment. The two general areas identified in this comment are being considered in the Event Sequence Analysis of the Phase 1 QRVA along with several other subdivided physical areas.

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			important for risk management decisions.	
21	12/26/2017	Red Hill Sec 8 QRVA IPR comments EPA DOH 2017 12 22.pdf	6. Historical data should be incorporated thoughtfully into the QRVA. The Navy should characterize whether data is useful and relevant given the facility's current configuration. For example, many previous initiating events were the result of leaks in the telltale system that was eventually decommissioned in 1984. Additionally, other leaks were the result of faulty repairs, such as what occurred during the January 2014 release from tank 5. The Navy should also consider partitioning the probability of initiating events into those that may occur during different modes of normal operation (static storage, fuel movements, etc.), and those that may occur during other periods, such as recommissioning.	Agree. We are investigating alternative failure rates based on removal of certain failure modes/mechanisms. We are considering alternative initiating event frequencies based on removal of the telltales. We are considering splitting initiating event frequencies to apply to the return-to-service process versus during the normal service period.
22	12/26/2017	Red Hill Sec 8 QRVA IPR comments EPA DOH 2017 12 22.pdf	7. The Navy should review environmental data trends from soil vapor monitoring probes and groundwater monitoring wells and discuss whether any aberrations correspond to historical releases from the facility.	We have agreed to look at these data trends. However, looking forward, we anticipate identifying potential dates or date ranges where aberrations appear to exist, and then questioning the Navy on if these aberrations correspond to any record of actual fuel inventory loss (e.g., based on AFHE, top-gage, and periodic fuel inventory balancing calculations). We would generally only assume fuel loss occurred if these fuel inventory measurement processes clearly indicated the loss.

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23	12/26/2017	Red Hill Sec 8 QRVA IPR comments EPA DOH 2017 12 22.pdf	<p>8. The Regulatory Agencies suggest revising the categorization of leak magnitude ranges for initiating events. Currently the assessment indicates three general ranges which are:</p> <ul style="list-style-type: none"> • Chronic or Undetected (below 0.7 gallon per hour or 16.8 gallons per day) • Small (below 72,000 gallons per day) • Large (above 72,000 gallons per day) <p>We suggest further segregating the small category range because 72,000 gallons per day may be much greater than a release caused by corrosion hole or crack. Per our preliminary calculation, 111 01h of an inch diameter hole could produce a leak of approximately 3,700 gallons per day at the 175-foot fill level assuming no back pressure on the hole. Given that one of the primary initiating events of concern could be caused by a through-hole corrosion or crack that has not been detected during tank inspection, the QRVA should reflect a conservative, but realistic initiating event. We suggest further research on corrosion/crack failures from data in the fuel industry to obtain a more realistic initiating event estimate.</p>	We are investigating how we can apply RHBFSF-specific information to perform the segregation of the small leak category initiating events. If the reviewer can provide specific references for the corrosion/crack failure research indicated, particularly for the RHBFSF, we are happy to apply that information in more refined segregated initiating event category frequency evaluation for the QRVA.
24	12/26/2017	Red Hill Sec 8 QRVA IPR comments EPA DOH 2017 12 22.pdf	<p>9. The Regulatory Agencies encourage the Navy to dedicate resources to risk communication and interpretation. The analysis and outcomes of this QRVA involve sophisticated numerical analysis, and it will be important to convey this information in a manner that is conducive for public consumption. We recommend that the Navy include an executive summary and conclusion that clearly summarize the study. The Navy should also develop other communication materials when the Report is submitted to the Regulatory Agencies, such as a two-page fact sheet.</p>	Agree. However, we see no recommended change to the IPR draft QRVA report based on this comment. We intend to report QRVA results in terms conducive for public consumption.

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25	12/26/2017	Red Hill Sec 8 QRVA IPR comments BWS 2017 12 18.pdf	We understand that the first draft of the QRVA Report will be made available after November 2018. Phase 1 is limited to certain internal events such as tank leaks, mechanical failures, and operational errors. Subsequent phases will address other hazards including seismic, fire, sabotage, and flooding. Also, the QRVA addresses only uncontrolled releases of fuel inventory past the boundary of the facility (Phase 2) and does not address the potential paths of the release or explicit aquifer risk. The QRVA Report will quantify the release risks for the facility as it exists today (including improvements currently under contract) but will not compare risks of Tank Upgrade Alternatives (TUAs). As such, the results of this QRVA Report will likely have little or no effect on the TUA decision (AOC Section 3).	In general, we agree with this comment. However, sabotage risk assessment is not planned to be performed for any Phase of the QRVA, as currently structured, as the Navy has removed that class of initiating events from consideration for the QRVA. We disagree, in general, with the final statement that "this QRVA Report will likely have little or no effect on the TUA decision (AOC Section 3)." We will not know that until the analysis is complete and we have fully digested the results.
26	12/26/2017	Red Hill Sec 8 QRVA IPR comments BWS 2017 12 18.pdf	The Navy is using a comprehensive QRVA methodology and underlying failure rate data conventionally employed at commercial nuclear power plants. In the ABS implementation, frequencies of leaks in the future are estimated from three sources: past leaks as recorded for the nuclear power plant generic data, leaks recorded at other navy tanks, and records of past leaks at Red Hill. There is currently no intention to incorporate the actual conditions (e.g., current corrosion depth, corrosion rates, weld defects) as determined from ongoing and upcoming testing. The potential for increased leak rates associated with aging mechanisms specific to these tanks will not be captured.	We are investigating application of generic data sources other than NUREG/CR-6928. Next, hypothetical failure rate acceleration over time can be included in the analysis, but only to the extent that we have sufficient information to adequately evaluate, quantitatively, what the failure rate acceleration factors would be over time. We do not have research supporting what those factors would be for the RHBFSF. Our team has significant experience in investigating time-dependent failure rates for equipment. If the reviewer can provide such information, it can be applied in the QRVA. However, we note that, because the RHBFSF tanks are periodically inspected, and associated repairs are implemented prior to placing inspected tanks back into service, there is a natural "renewal" process continuously underway at the facility. If properly applied, these inspections would, therefore, tend to counteract the impacts of failure rate

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				acceleration until and unless this acceleration factor was relatively large. We see no evidence of that based on tank inspection results. In addition, we might expect that tank inspection processes will improve over time, enabling the facility operator to more effectively and efficiently detect and measure flaws in the tanks. These factors support application of a constant failure rate model for this analysis. We agree to provide an example analytical approach in our analysis that could be applied for investigation of time-dependent corrosion rates in a QRVA, in general; however, we do not anticipate being able to apply such an approach without access to significant basic research on such issues at the RHBFSF.
27	12/26/2017	Red Hill Sec 8 QRVA IPR comments BWS 2017 12 18.pdf	Furthermore, we are concerned that ABS is relying too heavily on generic leak data (nuclear and other Navy tanks) at the expense of the actual Red Hill leak history which is quite extensive: 1,500 tank years of experience (20 tanks for 75 years). The nuclear power plant generic data (from NUREG/CR-6928, 2007 at Table: A.2.48-3) comprise reports from 671 relatively new (compared to Red Hill) unpressurized tanks in 101 commercial nuclear plants over an 8-year period (1997-2004). These data are predominantly from above ground storage tanks constructed to nuclear quality standards and maintained in a highly regulated environment. This entire database has recorded the sum total of just one small leak and zero large leaks. Likewise, the Navy tank leak data does not appear to have been carefully vetted for relevance to Red Hill tanks by removing tank leaks that are not from very large underground single-wall steel tanks that are not cathodically protected.	We acknowledge and understand that, via the concerns raised in BWS comments 27 through 37 in this table, BWS feels that a different approach should be applied to the development of tank leak initiating event frequencies for the QRVA. At the IPR meeting, BWS explained their preferred method of analysis, which discounts all other Navy tank failure data and all sources of generic tank failure data. As first suggested by BWS in August of 2016, we concurred that historic data on other Navy fuel tanks would be beneficial as additional source data for the analysis. The Navy has made this data available for our use. While we understand the BWS preferred method, which involves consideration of only RHBFSF failure events, we disagree that their preferred method represents conventional accepted QRVA best-estimate practice. Application of the BWS method can be applied in the QRVA as a separate sensitivity case study. The Navy is considering authorizing investigation of this type of sensitivity case study in a follow-on

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				phase of the current Phase 1 QRVA.
28	12/26/2017	Red Hill Sec 8 QRVA IPR comments BWS 2017 12 18.pdf	This questionable choice of data sources introduces a significantly optimistic bias in terms of future leak predictions compared to those already observed and reported. The Red Hill tanks, in terms of size, vintage and environment, bear little resemblance to tanks in the generic databases, and the reported leaks at Red Hill should be weighted more heavily. To demonstrate this problem, the BWS has recalculated estimated future leak rates using the same approach employed by ABS, but in a manner that better recognizes the limits of the generic data. Our analysis yields estimated leak frequencies significantly higher than the preliminary estimates in the QRVA Report. The details of this is presented below.	We acknowledge and understand that, via the concerns raised in BWS comments 27 through 37 in this table, BWS feels that a different approach should be applied to the development of tank leak initiating event frequencies for the QRVA. At the IPR meeting, BWS explained their preferred method of analysis, which discounts all other Navy tank failure data and all sources of generic tank failure data. As first suggested by BWS in August of 2016, we concurred that historic data on other Navy fuel tanks would be beneficial as additional source data for the analysis. The Navy has made this data available for our use. While we understand the BWS preferred method, which involves consideration of only RHBFSF failure events, we disagree that their preferred method represents conventional accepted QRVA best-estimate practice. Application of the BWS method can be applied in the QRVA as a separate sensitivity case study. The Navy is considering authorizing investigation of this type of sensitivity case study in a follow-on phase of the current Phase 1 QRVA.
29	12/26/2017	Red Hill Sec 8 QRVA IPR comments BWS 2017 12 18.pdf	Furthermore, the current risk assessment methodology described by ABS assumes the risk of a fuel leak is constant over the projected residual operating life of the facility and does not consider potential effects of aging. These effects may be mitigated by the Navy's non-destructive testing (NOT) and modified API tank inspection and repair methodology intended to assure leak-free operation for the 20-year period between inspections. However, as we have commented previously, the reliability of this methodology as applied at Red Hill has not yet been demonstrated.	We acknowledge and understand that, via the concerns raised in BWS comments 27 through 37 in this table, BWS feels that a different approach should be applied to the development of tank leak initiating event frequencies for the QRVA. At the IPR meeting, BWS explained their preferred method of analysis, which discounts all other Navy tank failure data and all sources of generic tank failure data. As first suggested by BWS in August of 2016, we concurred that historic data on other Navy fuel tanks would be beneficial as additional source data for the analysis. The Navy has made this data

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				available for our use. While we understand the BWS preferred method, which involves consideration of only RHBFSF failure events, we disagree that their preferred method represents conventional accepted QRVA best-estimate practice. Application of the BWS method can be applied in the QRVA as a separate sensitivity case study. The Navy is considering authorizing investigation of this type of sensitivity case study in a follow-on phase of the current Phase 1 QRVA.
30	12/26/2017	Red Hill Sec 8 QRVA IPR comments BWS 2017 12 18.pdf	Overall, we disagree with the manner in which preliminary estimates of future leak rates at Red Hill have been developed, and we believe the current approach has produced a biased (and significantly optimistic) projection of future performance.	We acknowledge and understand that, via the concerns raised in BWS comments 27 through 37 in this table, BWS feels that a different approach should be applied to the development of tank leak initiating event frequencies for the QRVA. At the IPR meeting, BWS explained their preferred method of analysis, which discounts all other Navy tank failure data and all sources of generic tank failure data. As first suggested by BWS in August of 2016, we concurred that historic data on other Navy fuel tanks would be beneficial as additional source data for the analysis. The Navy has made this data available for our use. While we understand the BWS preferred method, which involves consideration of only RHBFSF failure events, we disagree that their preferred method represents conventional accepted QRVA best-estimate practice. Application of the BWS method can be applied in the QRVA as a separate sensitivity case study. The Navy is considering authorizing investigation of this type of sensitivity case study in a follow-on phase of the current Phase 1 QRVA.

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31	12/26/2017	Red Hill Sec 8 QRVA IPR comments BWS 2017 12 18.pdf	<p>ABS lists three sources of data on leaks from unpressurized storage tanks: (1) a compilation of recent experience at United States (US) commercial nuclear power plants (NUREG/CR-6928, 2007); (2) data gathered from Navy installations other than the Red Hill facility; and, (3) a spreadsheet (referenced in the ABS report but not shared with BWS) that listed leak events that have occurred to date at Red Hill. The data from these three sources are summarized in Table 1.</p> <p>See Table 1. Data sources used by ABS in estimating frequencies of tank leakage at Red Hill (NUREG/CR-6928, 2007); ABS, 2017a at Table 5-12 and Table 5-14) in the BWS comment letter.</p>	<p>We acknowledge and understand that, via the concerns raised in BWS comments 27 through 37 in this table, BWS feels that a different approach should be applied to the development of tank leak initiating event frequencies for the QRVA. At the IPR meeting, BWS explained their preferred method of analysis, which discounts all other Navy tank failure data and all sources of generic tank failure data. As first suggested by BWS in August of 2016, we concurred that historic data on other Navy fuel tanks would be beneficial as additional source data for the analysis. The Navy has made this data available for our use. While we understand the BWS preferred method, which involves consideration of only RHBFSF failure events, we disagree that their preferred method represents conventional accepted QRVA best-estimate practice. Application of the BWS method can be applied in the QRVA as a separate sensitivity case study. The Navy is considering authorizing investigation of this type of sensitivity case study in a follow-on phase of the current Phase 1 QRVA.</p>

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32	12/26/2017	Red Hill Sec 8 QRVA IPR comments BWS 2017 12 18.pdf	As shown in Table 1, the NUREG data being used by ABS show a dramatically different operating experience at commercial nuclear plants than has been exhibited historically at the Red Hill facility-specifically , the data cited in the ABS report show that leaks (either small or large) of Red Hill tanks have occurred at a frequency more than 100 times greater than the corresponding frequency of nuclear plant tanks (1 leak in 5368 tank years for nuclear tanks= 0.000186 leaks per tank year vs 37 total leaks in 1,500 operating years for Red Hill tanks= 0.025 leaks per tank year) . This discrepancy raises questions about the relevance of the NUREG data and the effect of including those data in the QRVA Report of the Red Hill facility.	We acknowledge and understand that, via the concerns raised in BWS comments 27 through 37 in this table, BWS feels that a different approach should be applied to the development of tank leak initiating event frequencies for the QRVA. At the IPR meeting, BWS explained their preferred method of analysis, which discounts all other Navy tank failure data and all sources of generic tank failure data. As first suggested by BWS in August of 2016, we concurred that historic data on other Navy fuel tanks would be beneficial as additional source data for the analysis. The Navy has made this data available for our use. While we understand the BWS preferred method, which involves consideration of only RHBFSF failure events, we disagree that their preferred method represents conventional accepted QRVA best-estimate practice. Application of the BWS method can be applied in the QRVA as a separate sensitivity case study. The Navy is considering authorizing investigation of this type of sensitivity case study in a follow-on phase of the current Phase 1 QRVA.

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33	12/26/2017	Red Hill Sec 8 QRVA IPR comments BWS 2017 12 18.pdf	Furthermore, the appendices to NUREG/CR-6928 appear to indicate the single recorded leak shown in Table 1 occurred in a tank classified as "Other" (among 26 listed categories of unpressurized tanks). This "Other" category contains only 19 tanks and may be the only category in the NUREG database containing underground tanks. The system descriptions in Section A.2.48.2 suggest that tanks in the other 25 categories are primarily above ground and store water rather than fuel. No leaks were reported in any of these tanks over the 1997-2004 (8-year) time period. Inclusion in the QRVA analysis of data from tanks of questionable relevance is therefore likely to underestimate leak rates at Red Hill. A separate analysis (reported in Table A.2.48-8) shows the mean leak rate (1 leak every 104 years) for unpressurized tanks in this "Other" category is almost 40 times higher than the mean leak rate (1 leak every 3,565 years, see Table 2 below) for all tanks using all the NUREG data as ABS currently does in the QRVA Report.	We acknowledge and understand that, via the concerns raised in BWS comments 27 through 37 in this table, BWS feels that a different approach should be applied to the development of tank leak initiating event frequencies for the QRVA. At the IPR meeting, BWS explained their preferred method of analysis, which discounts all other Navy tank failure data and all sources of generic tank failure data. As first suggested by BWS in August of 2016, we concurred that historic data on other Navy fuel tanks would be beneficial as additional source data for the analysis. The Navy has made this data available for our use. While we understand the BWS preferred method, which involves consideration of only RHBFSF failure events, we disagree that their preferred method represents conventional accepted QRVA best-estimate practice. Application of the BWS method can be applied in the QRVA as a separate sensitivity case study. The Navy is considering authorizing investigation of this type of sensitivity case study in a follow-on phase of the current Phase 1 QRVA.

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34	12/26/2017	Red Hill Sec 8 QRVA IPR comments BWS 2017 12 18.pdf	In the limited results presented so far in the QRVA Report, ABS has effectively merged data from Red Hill with data from other sources to develop estimates of the frequency of small and large leaks from unpressurized storage tanks. The method of combining data used by ABS is called "Bayesian updating". In this approach, before considering the Red Hill data, ABS analysts specify a "prior" distribution, which expresses how frequently small or large leaks are expected based on other sources of information, such as the NUREG data. (For example, one can calculate the probability a small leak will occur at a rate greater than one per 1,000 years). This prior distribution is then "updated" with Red Hill data to obtain a "posterior" distribution, which expresses how frequently small or large leaks are expected based on all sources of information, including the Red Hill data.	We acknowledge and understand that, via the concerns raised in BWS comments 27 through 37 in this table, BWS feels that a different approach should be applied to the development of tank leak initiating event frequencies for the QRVA. At the IPR meeting, BWS explained their preferred method of analysis, which discounts all other Navy tank failure data and all sources of generic tank failure data. As first suggested by BWS in August of 2016, we concurred that historic data on other Navy fuel tanks would be beneficial as additional source data for the analysis. The Navy has made this data available for our use. While we understand the BWS preferred method, which involves consideration of only RHBFSF failure events, we disagree that their preferred method represents conventional accepted QRVA best-estimate practice. Application of the BWS method can be applied in the QRVA as a separate sensitivity case study. The Navy is considering authorizing investigation of this type of sensitivity case study in a follow-on phase of the current Phase 1 QRVA.

QRVA Phase 1 - IPR Comments (Continued)

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35	12/26/2017	Red Hill Sec 8 QRVA IPR comments BWS 2017 12 18.pdf	<p>In the QRVA Report, ABS presents results from two separate analyses: a one-stage analysis incorporating leak data from NUREG/CR-6928 and the Red Hill site and a two-stage analysis also incorporating leak data from other Navy installations. After further evaluation of the data, ABS stated it favored its one-stage analysis, results of which are summarized in the second to fourth columns of Table 2. The reported values are the expected leak frequencies using only the NUREG data (prior mean) and then combining the NUREG data with Red Hill data via Bayesian updating (posterior mean). For purposes of comparison, the last column of Table 2 shows the corresponding expected leak frequencies using only the Red Hill data, obtained via Bayesian updating with a "non-informative" prior distribution -i.e., without relying on the NUREG data of questionable relevance.</p> <p>See Table 2 in the BWS comment letter. Expected frequencies of individual tank leakage at Red Hill from ABS analysis, compared to alternative analysis using all Red Hill data only (ABS, 2017a, Table 5-10 & 5-15). Hours have been converted to years in this table.</p> <p>As shown in Table 2, the expected leak frequencies of individual tanks at Red Hill are one-to-two orders of magnitude greater when only Red Hill data are used, compared to the values obtained by ABS using NUREG data and the data for individual Red Hill tanks (while excluding data from the other 19 Red Hill tanks).</p> <p>The vast discrepancy between the NUREG data and the recorded experience at Red Hill is underscored further by comparing not only the expected frequencies of small and large leaks (as in Table 2), but also corresponding lower and upper bounds. For the prior distributions based on NUREG data, the first column of Table 3 reports. in addition to the</p>	<p>We acknowledge and understand that, via the concerns raised in BWS comments 27 through 37 in this table, BWS feels that a different approach should be applied to the development of tank leak initiating event frequencies for the QRVA. At the IPR meeting, BWS explained their preferred method of analysis, which discounts all other Navy tank failure data and all sources of generic tank failure data. As first suggested by BWS in August of 2016, we concurred that historic data on other Navy fuel tanks would be beneficial as additional source data for the analysis. The Navy has made this data available for our use. While we understand the BWS preferred method, which involves consideration of only RHBFSF failure events, we disagree that their preferred method represents conventional accepted QRVA best-estimate practice. Application of the BWS method can be applied in the QRVA as a separate sensitivity case study. The Navy is considering authorizing investigation of this type of sensitivity case study in a follow-on phase of the current Phase 1 QRVA.</p>

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36	12/26/2017	Red Hill Sec 8 QRVA IPR comments BWS 2017 12 18.pdf	<p>See Table 3 in the BWS comment letter. Comparing the estimated frequencies of small and large leaks based on NUREG data versus Red Hill recorded leak data.</p> <p>In addition, as shown in Table 3, the 5% values of the NUREG prior are exceedingly small: one in a million years for small leaks and nearly one in a billion years for large leaks. These extreme time periods exceed any reasonable expectation of storage tank life and provide another indication of the unrealistic optimism of estimates based on the NUREG data.</p>	<p>We acknowledge and understand that, via the concerns raised in BWS comments 27 through 37 in this table, BWS feels that a different approach should be applied to the development of tank leak initiating event frequencies for the QRVA. At the IPR meeting, BWS explained their preferred method of analysis, which discounts all other Navy tank failure data and all sources of generic tank failure data. As first suggested by BWS in August of 2016, we concurred that historic data on other Navy fuel tanks would be beneficial as additional source data for the analysis. The Navy has made this data available for our use. While we understand the BWS preferred method, which involves consideration of only RHBFSF failure events, we disagree that their preferred method represents conventional accepted QRVA best-estimate practice. Application of the BWS method can be applied in the QRVA as a separate sensitivity case study. The Navy is considering authorizing investigation of this type of sensitivity case study in a follow-on phase of the current Phase 1 QRVA.</p>
37	12/26/2017	Red Hill Sec 8 QRVA IPR comments BWS 2017 12 18.pdf	<p>Table 4 shows this optimism persists in the ABS estimates of leak frequencies for individual Red Hill tanks. The ABS estimates for Tank 3, in particular, strain credulity since the other 19 Red Hill tanks have collectively had 27 small and 10 large leaks reported in the last 70 years. It is simply not credible to expect that Tank 3 could operate for thousands, let alone millions (or billions) of years, without experiencing a single leak.</p>	<p>We acknowledge and understand that, via the concerns raised in BWS comments 27 through 37 in this table, BWS feels that a different approach should be applied to the development of tank leak initiating event frequencies for the QRVA. At the IPR meeting, BWS explained their preferred method of analysis, which discounts all other Navy tank failure data and all sources of generic tank failure data. As first suggested</p>

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			See Table 4 in the BWS comment letter. Comparing ABS estimates (single-stage update) of leak frequencies for Tanks 1 and 3 with Red Hill recorded leak data.	by BWS in August of 2016, we concurred that historic data on other Navy fuel tanks would be beneficial as additional source data for the analysis. The Navy has made this data available for our use. While we understand the BWS preferred method, which involves consideration of only RHBFSF failure events, we disagree that their preferred method represents conventional accepted QRVA best-estimate practice. Application of the BWS method can be applied in the QRVA as a separate sensitivity case study. The Navy is considering authorizing investigation of this type of sensitivity case study in a follow-on phase of the current Phase 1 QRVA.
38	12/26/2017	Red Hill Sec 8 QRVA IPR comments BWS 2017 12 18.pdf	The November 27, 2017 QVRA draft report proposes a triangular distribution (0, 0.7, and 1.4) gallons per hour (gph) for the chronic leak rate. However, ABS indicated during the 5 & 7 December 2017 meetings that they will revise this assumption and use a uniform distribution (0-0.5) gph for the chronic leak rate. This change reduces by almost a factor of 3 the maximum possible rate of chronic fuel leakage (from 1.4 to 0.5 gph).	We agree with the comment statement here, and we are confident that the change we described at the IPR Meeting is technically justified based on our refined understanding of the RHBFSF. We agree to provide additional discussion in the QRVA report to support this change.
39	12/26/2017	Red Hill Sec 8 QRVA IPR comments BWS 2017 12 18.pdf	Additional documentation regarding how this 0.5 gal/hr. detection limit is arrived at should be included. Discussion of the applicability of the leak detection limits equation from Mass Technology Corporation (MTC), and confirmation that the equation can be applied to tanks as large as the Red Hill tanks should also be included.	We agree to provide additional discussion on this topic, to include MTC information, in the final report.
40	12/26/2017	Red Hill Sec 8 QRVA IPR	We understand that this 0.5 gph leak rate is the largest "undetectable" leak rate if the MTC	We are currently under the understanding that the MTC technology has been approved

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		comments BWS 2017 12 18.pdf	technology is successfully implemented in the future on a "continuous" basis at the Red Hill tank facility. This detection technology has not yet been implemented or demonstrated at the Red Hill facility and thus should not be the current QRVA evaluation basis as the Phase 1QRVA freezes the facility design as of July 27, 2017.	for implementation as of the design freeze date of our project, July 27, 2017, and, therefore, it is included as a basis of this analysis. We see evidence in inspection reports dated in 2015 that the technology is currently in place at the RHBFSF. If this is incorrect, and is confirmed by the Navy, we agree to revise the analysis based on this change.
41	12/26/2017	Red Hill Sec 8 QRVA IPR comments BWS 2017 12 18.pdf	<p>BWS understands that the installed unscheduled fuel movement (UFM) Alarms system provides the current "continuous" leak detection limit, which is significantly higher. BWS's understanding of the Red Hill leak testing frequency and minimum leak rate detectible is summarized in Table 5 of the BWS comment letter. Table 5 also shows how much would leak from a single tank if a leak were occurring just below the minimum detection limit for one year. It is ABS understanding that there are leak detection methods (inventory control, long term monitoring of fuel levels, inventory control, and the like) that can limit the undetectable amount leaked to levels less than those shown in Table 5 and that the QRVA analysis will be better able to estimate probability of release volumes prior to detection and completion of corrective action.</p> <p>See Table 5 of the BWS comment letter. Red Hill Testing and Leak Detection Limits.</p>	In general, we agree with this comment. We see no need for revision of our analysis based on this comment at this time.

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42	12/26/2017	S. L. Chow Email dated 12/26/2017 3:20 PM	Elton Saito , DLA - "Table of contents shows "Section 16 QRVA (Phase 1) Recommendations". I think there needs to be further discussion with the parties to determine if we should have Section 16. It might be more advantageous for DoD if only a section like section 17 "Considerations for Future Facility Risk Case Studies" was provided. This will allow DoD to dictate the follow on actions/studies versus having recommendations in the study and DoD not implementing them which could lead to more scrutiny by stakeholders and the public. I would prefer the same process we are using for the TUA report. Have a separate Decision/Follow-on process."	While we believe a "Recommendations" section would be constructive, and while we typically include such a section in QRVA reports, we can delete that section from the report, as desired by the Navy.
43	12/26/2017	S. L. Chow Email dated 12/26/2017 3:20 PM	Danae Smith, NAVSUP Energy has reviewed, but has no comment.	No resolution response required.